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Remote hydraulic fracturing at weak interfaces

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As the most effective reservoir stimulation technique, hydraulic fracturing has been applied since the 1950s. At the same time, hydraulic fracturing can induce seismicity or result in the loss of containment of subsurface fluids due to the high injection pressure applied during its operation, leading some projects to eventual shut-down. To mitigate such adverse impacts, an alternative approach known as hydro-shearing has been promoted for some enhanced geothermal system projects, wherein the injection pressure is kept at a low level, aiming to stimulate pre-existing networks of fractures by shearing. However, the practical effectiveness of hydro shearing is yet to be proven. In this talk, we propose another alternative stimulation approach using a low-viscosity fluid. We numerically demonstrate that with low-viscosity fluid injection, we can fracture discontinuous interfaces such as grain boundaries or natural fractures without initiating fractures at the injection point. Our results indicate the possibility of engineering reservoir stimulation operations without applying high injection pressure.

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References

Primary authors: YOU, Tao (Montanuniversität Leoben); Prof. YOSHIOKA, Keita (Montanuniversität Leoben)

Presenter: YOU, Tao (Montanuniversität Leoben)

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